Graphing Secant and Cosecant Functions

Remember, $\sec x = \dfrac{1}{\cos x}$ and $\csc x = \dfrac{1}{\sin x}$.

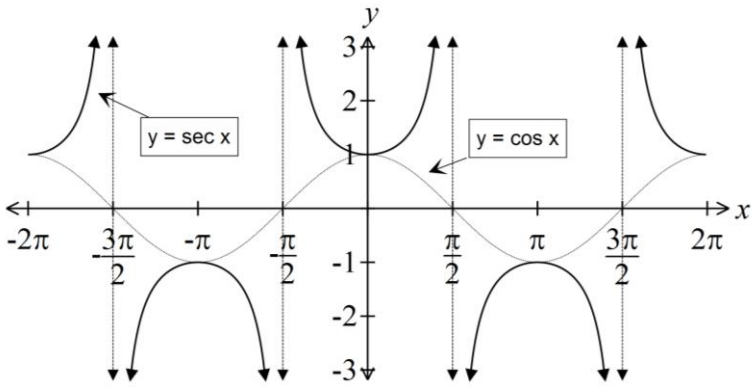
- We aren't allowed to divide by 0. This means:
  - Whenever $\cos x = 0$, $\sec x$ is undefined, and whenever $\sin x = 0$, $\csc x$ is undefined.
    - Places where $\cos x = 0$ and $\sec x$ is undefined: _____
    - Places where $\sin x = 0$ and $\csc x$ is undefined: _____
  - The graphs of $y = \sec x$ and $y = \csc x$ have vertical asymptotes at these locations.
  - **To Find the Equations of the Asymptotes:**
    - Find the smallest non-negative x where the function is undefined. Add this value to k times the distance between the asymptotes.
      $x = \text{first non-negative asymptote} + (\text{distance between asymptotes}) \cdot k$

Graphing Secant Functions

- To graph $y = a\sec\left[b\left(x-c\right)\right]+d$:
  - Sketch the graph of $y = a\cos\left[b\left(x-c\right)\right]+d.$
  - Wherever the graph of the cosine function crosses its center point, draw a vertical asymptote.
  - The local maxima of the graph of the cosine function become local minima on the graph of the secant function with $y \to \infty$ as x approaches the asymptotes on either side. The local minima of the graph of the cosine function become local maxima on the graph of the secant function with $y \to -\infty$ as x approaches the asymptotes on either side.

Key points on the graph of $y = \sec x$:

x	0	$\pi/2$	π	$3\pi/2$	2π
$y = \sec x$	1	undef.	–1	undef.	1

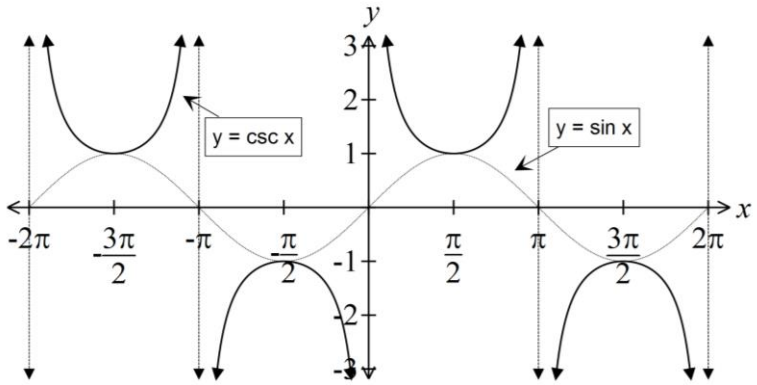


Graphing Cosecant Functions

- To graph $y = a\csc\left[b\left(x-c\right)\right]+d$:
  - Sketch the graph of $y = a\sin\left[b\left(x-c\right)\right]+d.$
  - Wherever the graph of the sine function crosses its center point, draw a vertical asymptote.
  - The local maxima of the graph of the sine function become local minima on the graph of the cosecant function with $y \to \infty$ as x approaches the asymptotes on either side. The local minima of the graph of the sine function become local maxima on the graph of the cosecant function with $y \to -\infty$ as x approaches the asymptotes on either side.

Key points on the graph of $y = \csc x$:

x	0	$\pi/2$	π	$3\pi/2$	2π
$y = \csc x$	undef.	1	undef.	–1	undef.



Examples: Graph the following functions. Find the period, asymptotes, and range of each.

$y = 3\sec\left(2x\right)$

$y = \csc\left(x-\frac{\pi}{4}\right)+2$

$y = \sec\left(\frac{1}{2}x+\frac{\pi}{6}\right)$

$y = 2\csc\left(\frac{\pi}{4}x+\frac{3\pi}{4}\right)$